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Claims

1. Fuel cell system comprising at least one fuel cell (10) which includes an anode compartment (12) and a cathode compartment (14) which are separated from one another by a proton-conducting membrane (16), further comprising a cathode feeder (20) to delivering oxygen-containing gas to the cathode compartment (14), an anode feeder (18) for delivering a liquid coolant/fuel mixture to the anode compartment (12), the anode compartment (12) being disposed in an anode circuit which comprises a gas separator and a pump (34), characterized in that cooling of the coolant/fuel mixture circulating in the anode circuit is effected by the fuel cell (10) which is designed for operation involving water break-through from the anode compartment (12) into the cathode compartment (14), and in that the operating temperature of the fuel cell (10) is set by controlling the cathode compartment (14) pressure and/or the delivery of the pump (34) in the anode circuit.

2. Fuel cell system according to Claim 1, characterized in that the water vapour generated in the cathode compartment (14) is essentially delivered to an expander unit (32).

3. Fuel cell system according to Claim 1, characterized in that the anode circuit comprises a holding and purification tank (50).

4. Fuel cell system according to Claim 3, characterized in that the holding and purification tank (50) is disposed in a subsidiary branch (48, 66) of the anode offtake upstream of the gas separator (52).

5. Fuel cell system according to any one of Claims 1 to 4, characterized in that the cathode compartment (14) is disposed in a cathode circuit comprising a compressor/expander unit (28, 32).

5 6. Fuel cell system according to Claim 5, characterized in that in the cathode circuit downstream of the compressor (28) a supercharger intercooler (29) and downstream of the expander (32) a cooler (46) and at least one water separator (61) for water recovery are provided.

10 7. Fuel cell system according to Claim 6, characterized in that recycling of recovered water into the anode circuit is provided via a feedback line (64).

8. Fuel cell system according to Claim 7, characterized in that recycling of recovered water into the holding and purification tank (50) is effected.

15 9. Method of operating a fuel cell system comprising at least one fuel cell (10) which includes an anode compartment (12) and a cathode compartment (14) which are separated from one another by a proton-conducting membrane (16), further comprising an anode feeder (18) for delivering a liquid coolant/fuel mixture to the anode compartment (12),

20 characterized in that

25 operation of the proton-conducting membrane (16) involves water break-through from the anode compartment (12) into the cathode compartment (14), and cooling of the coolant/fuel mixture circulating in the anode circuit is effected by the fuel cell (10), the operating temperature

30 of the fuel cell (10) being set by controlling the cathode compartment (14) pressure and/or the volume flow of the coolant/fuel mixture into the anode compartment.